

AMENDMENTS TO THE CLAIMS

Claims 1-4 (Cancelled)

5. (Currently Amended) A galvanometer scanner comprising a partial rotation torque motor with a rotatable shaft supported within about one micro-radian of axial precision over substantially the full service temperature range by two, non-lubricated all ceramic ball bearing assemblies, each said ceramic bearing assembly comprising an ellipsoidal ceramic inner race, ceramic bearing balls, and an ~~ellipsoidal~~ ellipsoidal ceramic outer race, said bearing assemblies supported by a bearing support structure, said shaft and said bearing support structure having substantially the same coefficient of thermal expansion as said ceramic bearing assemblies.

6. (Cancelled)

7. (Previously Amended) A galvanometer scanner according to claim 5, said shaft and said bearing support structure fabricated of nickel-iron alloy.

8. (Previously Amended) A galvanometer scanner according to claim 5, said shaft being electrically isolated from said bearing support structure.

9. (Currently Amended) A partial rotation torque motor for use in a galvanometer scanner, comprising a rotatable shaft supported within about one micro-radian of axial precision over substantially the full service temperature range by at least two all ceramic ball bearing assemblies, said bearing assemblies supported by a bearing support structure, said shaft and said bearing support structure fabricated of nickel-iron alloy, each said ceramic bearing assembly comprising an ellipsoidal ceramic inner race, ceramic bearing balls, and an ellipsoidal ceramic outer race, said shaft and said bearing support structure having the same coefficient of thermal expansion as said all ceramic bearing assemblies, said shaft being electrically isolated from said bearing support structure.

10. (Currently Amended) A partial-rotation torque motor comprising
- a reversibly rotatable shaft rotationally restricted to less than one full turn, and
- a stator and housing assembly within which said shaft is located, said shaft supported within about one micro-radian of axial precision over substantially the full service temperature range by two all ceramic ball bearing assemblies, each said assembly including an ellipsoidal ceramic inner race mounted on said rotatable shaft and an ellipsoidal ceramic outer race mounted in said housing and multiple ceramic bearing balls interspersed in a single plane there between, said shaft said stator and said housing assembly fabricated of a nickel-iron alloy of matched thermal expansion to said all ceramic bearing assemblies, said shaft being electrically isolated from said stator and said housing.
11. (Original) A partial-rotation torque motor according to claim 10, for use in a galvanometer scanner.
12. (Currently Amended) An electromagnetic induction reciprocating rotary device comprising a rotatable shaft supported for rotation within about one micro-radian of axial precision over substantially the full service temperature range by at least ~~one~~ two all ceramic ball bearing ~~assembly assemblies~~, each said assembly including an ellipsoidal ceramic inner and outer ~~aces~~ race with multiple ceramic bearing balls interspersed in a single plane there between, said ball bearing assembly being supported by a bearing support structure wherein said shaft, said bearing support structure and said ball bearing assembly have a substantially similar coefficient of thermal expansion.
13. (Previously Amended) An electromagnetic induction reciprocating rotary device according to claim 12, said rotatable shaft comprising a reversibly rotatable shaft rotationally restricted to less than one full turn.
14. (Cancelled)

15. (Previously Amended) An electromagnetic induction reciprocating rotary device according to claim 12, wherein said shaft and said bearing support structure are fabricated of a nickel-iron alloy having a substantially similar coefficient of thermal expansion to said all ceramic bearing assembly.

16. (Previously Amended) An electromagnetic induction reciprocating rotary device according to claim 12, wherein said shaft is electrically isolated from said bearing support structure.

17. (Previously Amended) An electromagnetic induction reciprocating rotary device according to claim 12, said device comprising a partial rotation torque motor for use in a galvanometer scanner.

18. (Currently Amended) A method for providing improved shaft alignment, acceleration and bearing life in an electromagnetic induction rotary device comprising the steps:

supporting a shaft for partial rotation within about one micro radian of axial precision over substantially the full service temperature range with an all ceramic bearing assembly comprising an ellipsoidal ceramic inner race attached to the shaft, an ellipsoidal ceramic outer race and a plurality of ceramic rotating members captured there between, said inner race, outer race and rotating members having substantially the same coefficient of thermal expansion;

supporting the outer race in a fixed bearing support structure; and

fabricating the shaft and the bearing support structure from a material having a substantially similar coefficient of thermal expansion as said inner race, outer race and rotating members.

19. (Previously Amended) A method for providing improved shaft alignment, acceleration and bearing life according to claim 18, said material for said fabricating of the shaft and the bearing support structure comprising a nickel-iron alloy.

20. (Previously Amended) A method for providing improved shaft alignment, acceleration and bearing life according to claim 18, said electromagnetic induction rotary device comprising a partial rotation torque motor for use in a galvanometer scanner.

21. (Previously Added) A galvanometer scanner according to claim 12, said outer race being attached by a glue joint to said bearing support structure, said inner race being attached by a glue joint to said shaft.

22. (Previously Added) A partial rotation torque motor according to claim 18, said step of supporting the shaft for rotation with an all ceramic bearing assembly comprising attaching said inner race to said shaft with a glue joint.

23. (Previously Added) A partial rotation torque motor according to claim 18, said step of supporting the outer race in a fixed bearing support structure comprising attaching said outer race to said fixed bearing support structure with a glue joint.